



2021 Q1 Report on Market Issues and Performance

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Department of Market Monitoring, California ISO
Amelia Blanke, Ph.D., Manager of Monitoring and Reporting

<http://www.caiso.com/Documents/2021-First-Quarter-Report-on-Market-Issues-and-Performance-Jun-9-2021.pdf>

Highlights of Q1 2021 market performance

- Cold February weather leads to high prices
 - lower hydro
 - record high gas prices
- Generation outages increase
- 5-minute prices lower than 15-minute and day-ahead
- Imbalance conformance adjustments continue to increase in the 15-minute market
- Settlement timeline changes delay reporting on some areas

Western Energy Imbalance Market highlights

- **Turlock Irrigation District and the Balancing Authority of Northern California** joined the EIM on March 25,
 - adding > 6 GW of generation and > 3 GW of transfer
- **Sufficiency test failures** and subsequent under-supply power balance constraint relaxations drove average real-time prices higher for Arizona Public Service, NV Energy, and the Salt River Project in peak net load hours

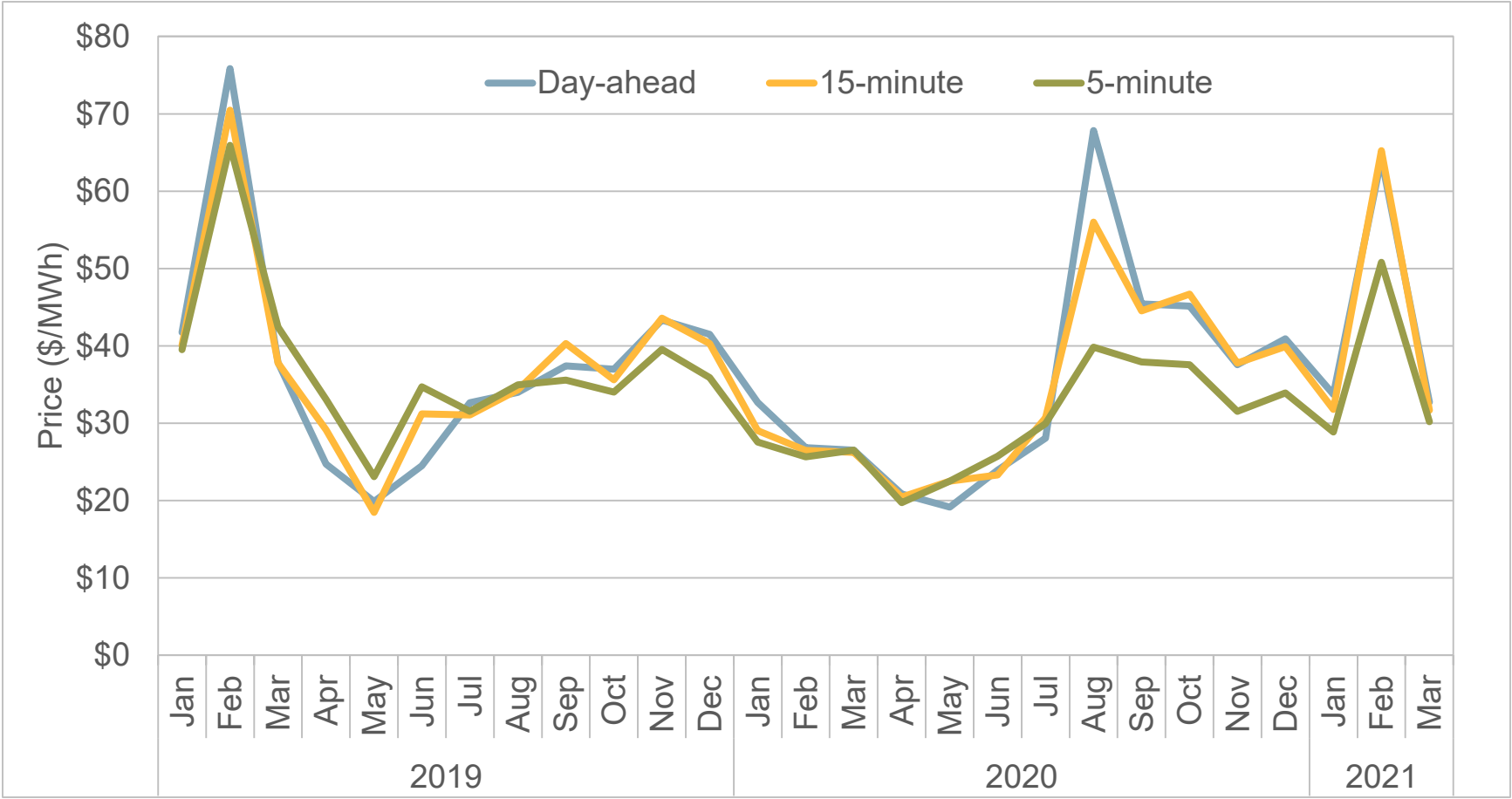
Western Energy Imbalance Market highlights: pricing patterns

- Prices in the Southwestern areas averaged over \$60/MWh in February, exceeding the rest of the system
- Peak prices in BANC and the ISO exceeded the rest of the system on average in Q1 due to GHG and congestion
- Northwest prices regularly lower than the rest of the system due to limited transfer capability

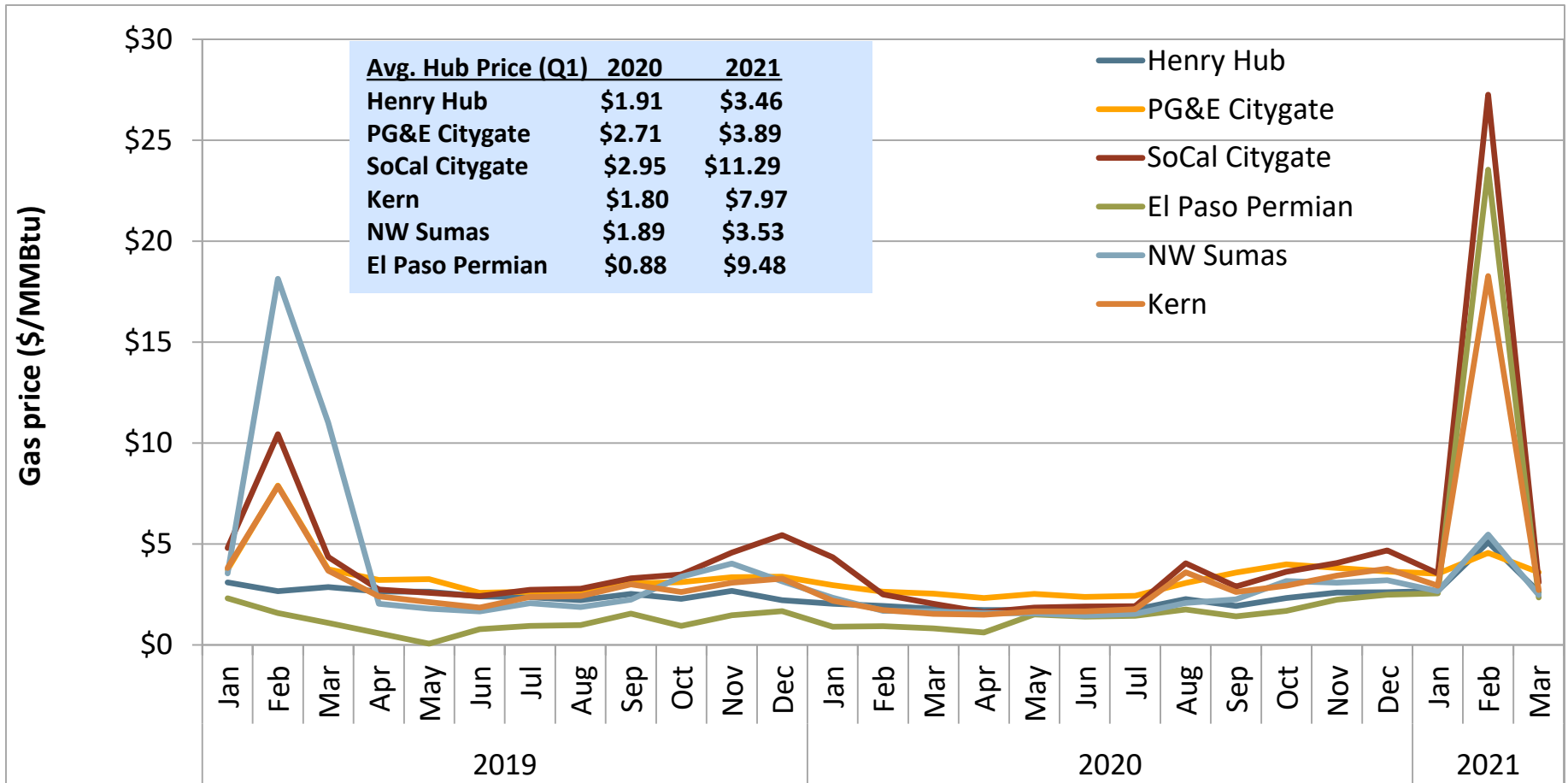
Special issues covered in Q1 market report

- Commitment cost and default energy bid enhancements
 - Allows scheduling coordinators to request reference level adjustments and apply for after market cost recovery
- FERC Order 831 Compliance – phase 1
 - Allows bidding between \$1,000/MWh - \$2,000/MWh
 - Sets power balance constraint violation penalty prices to \$2,000/MWh

Market prices were significantly higher than the same quarter of 2020

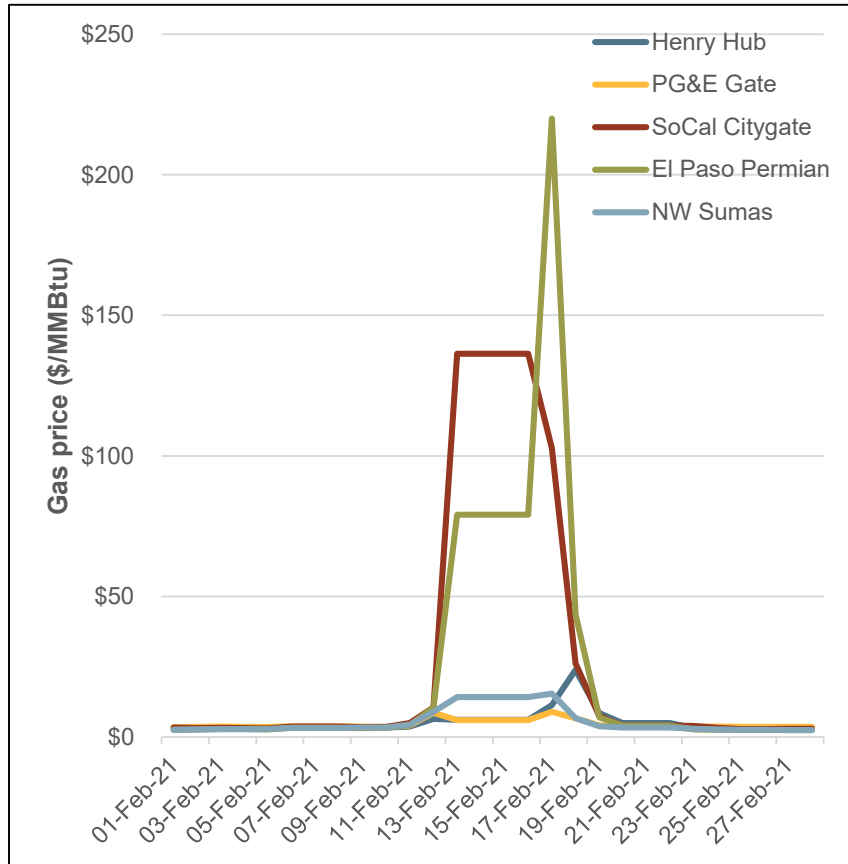


Gas prices increase in all major gas trading hubs in the west compared to Q1 2020

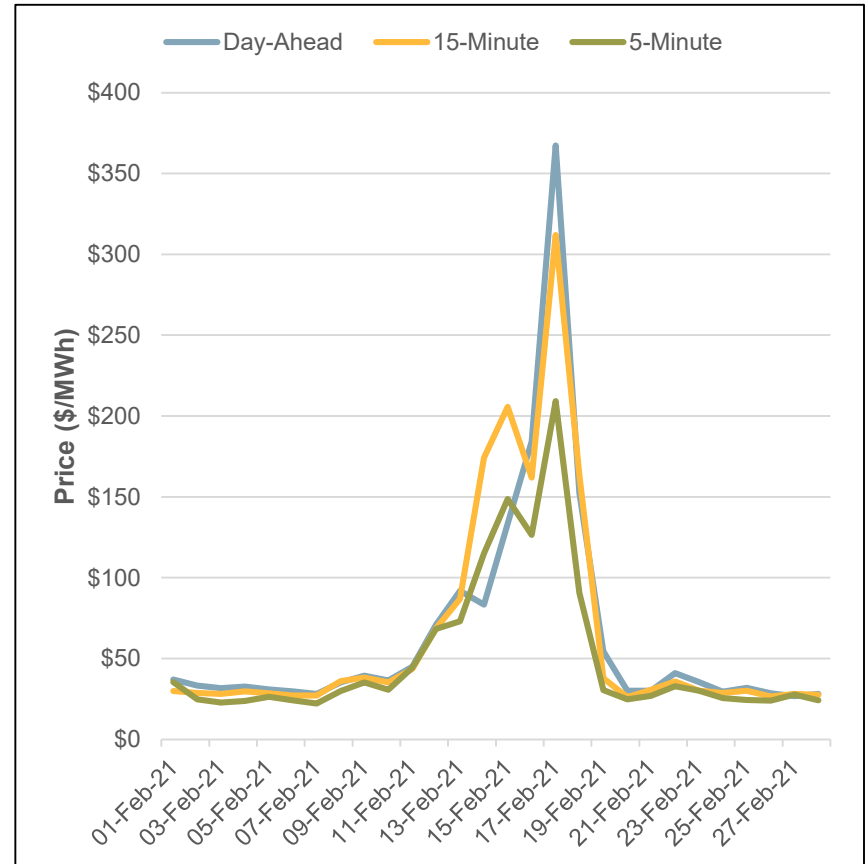


Natural gas prices at SoCal Citygate were over \$100/MMBtu from February 13 to February 17

Natural gas prices

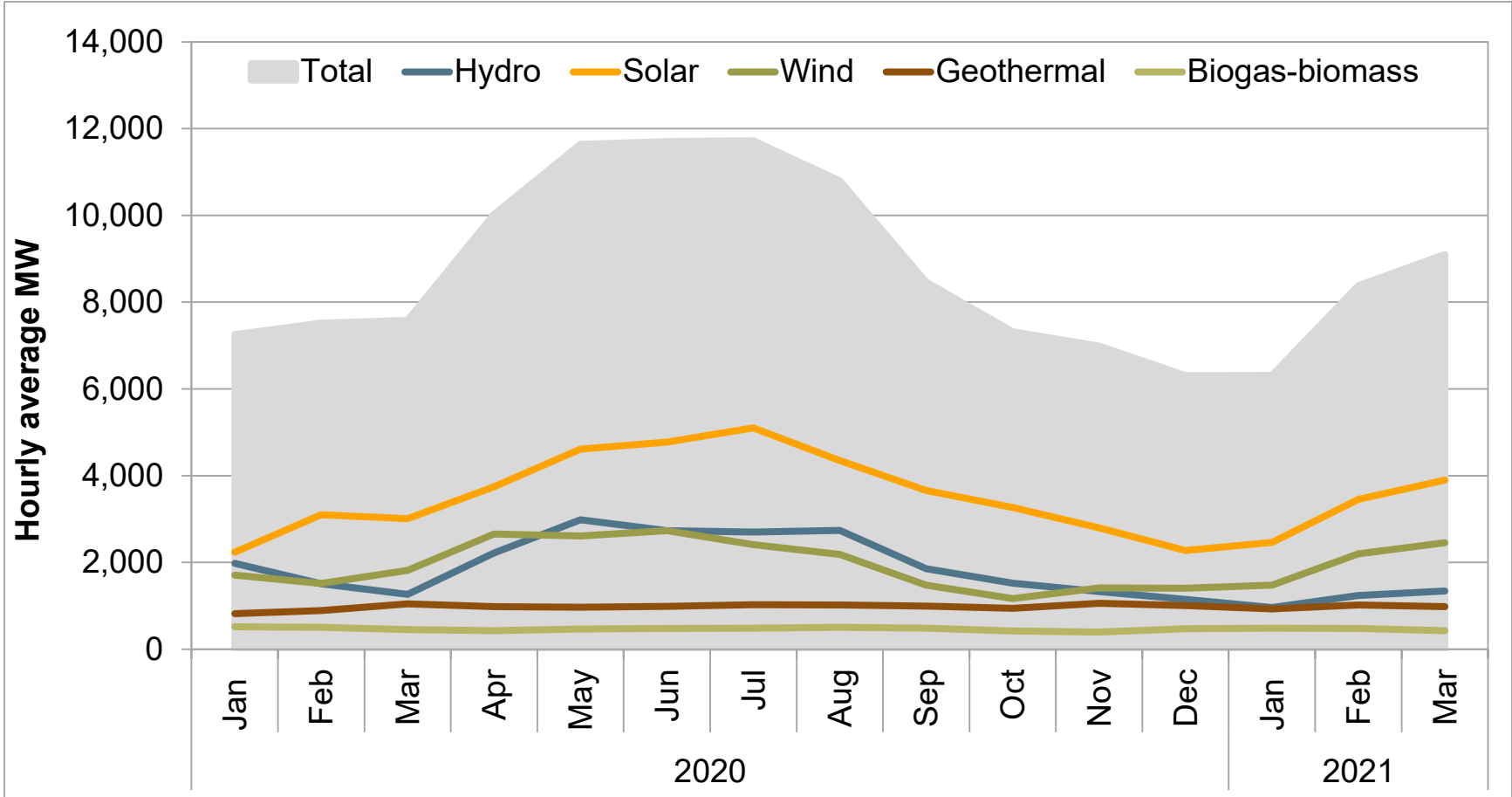


Electricity prices

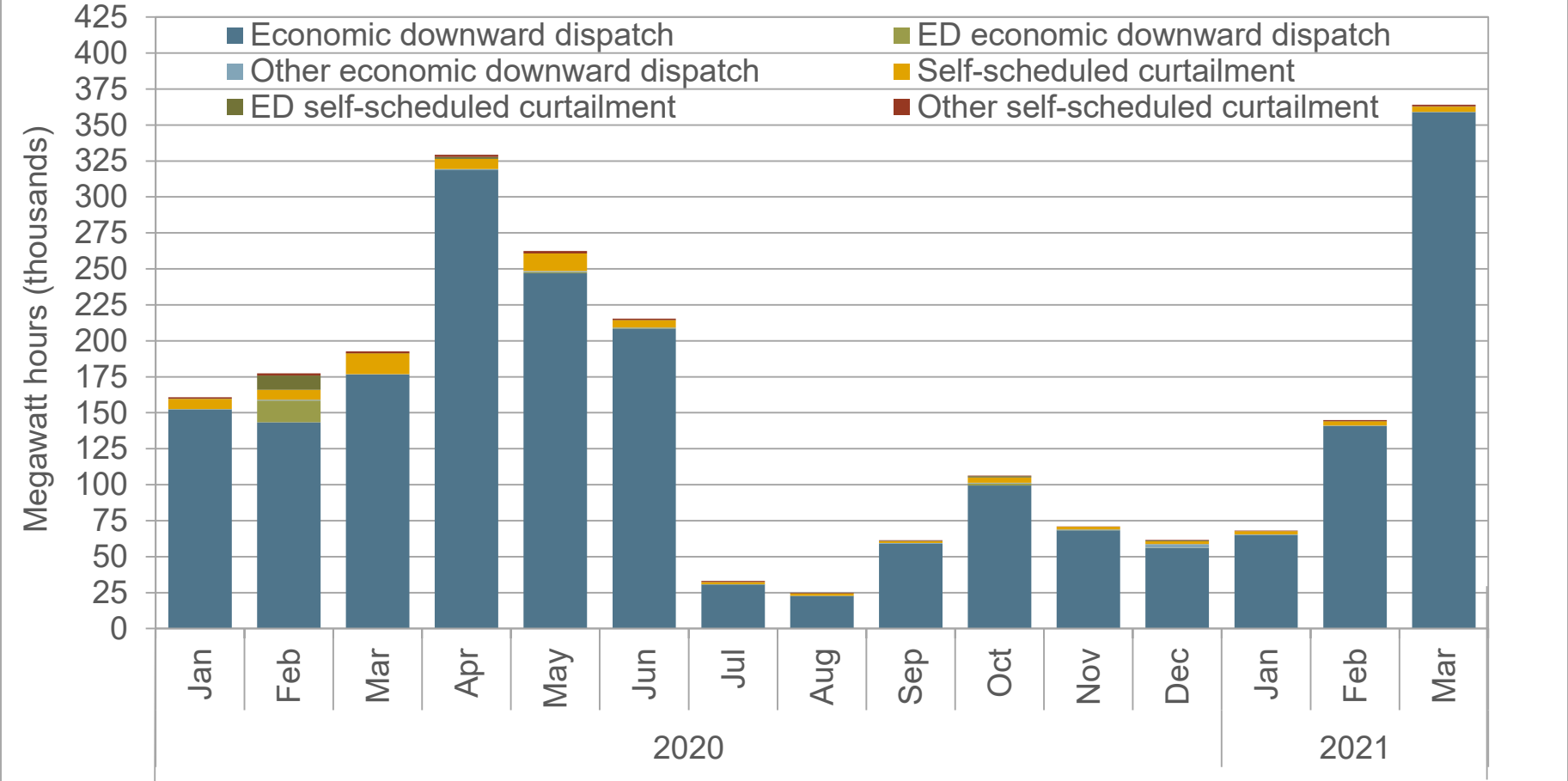


For further detail see: <http://www.aiso.com/Documents/Presentation-MarketPerformance-PlanningForum-Mar4-2021.pdf> p 6-24

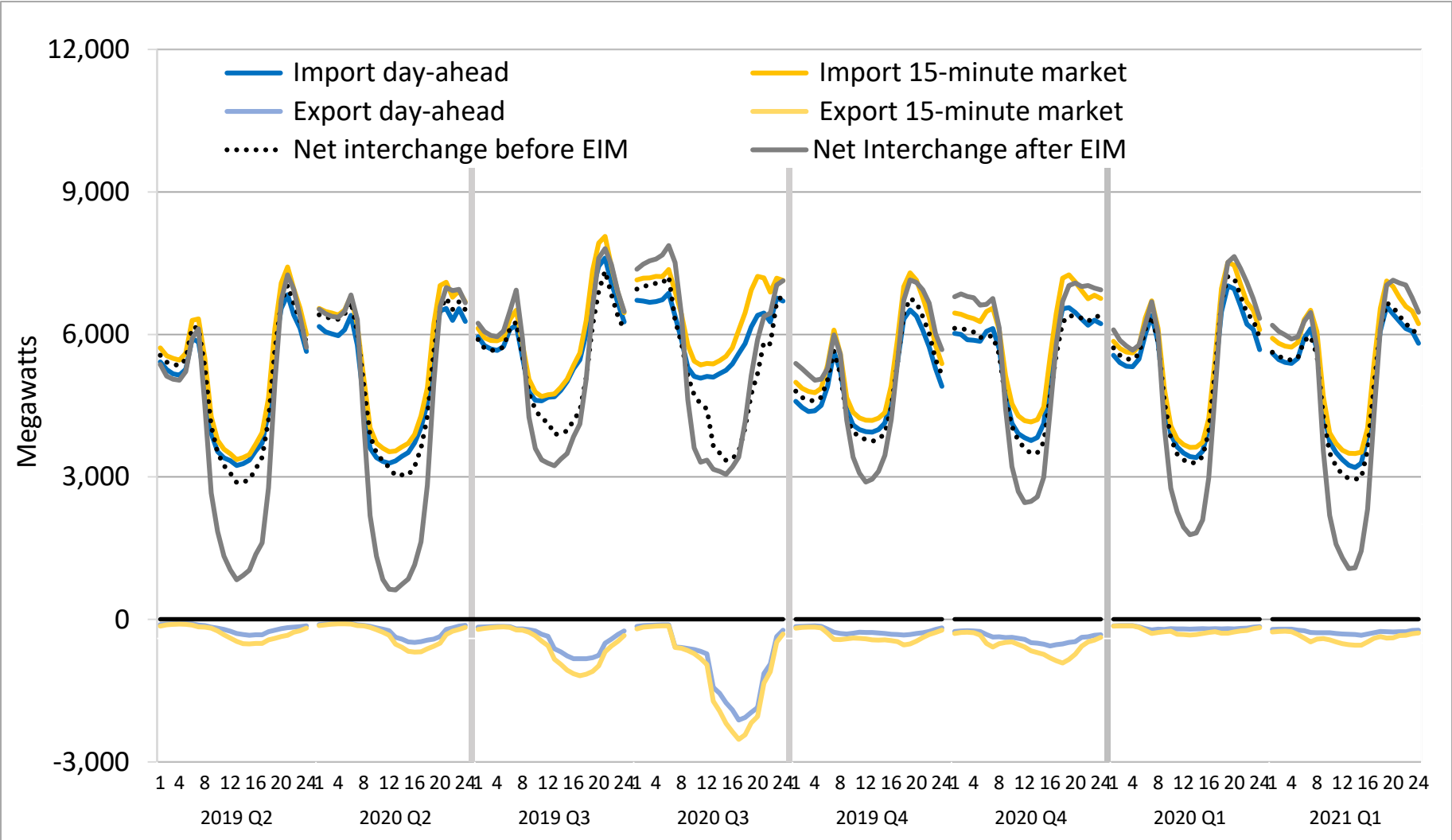
Non-hydroelectric renewable production increased 15%, while hydroelectric production decreased 25%, compared to Q1 2020, for an overall renewable increase of 6% (481 MW)



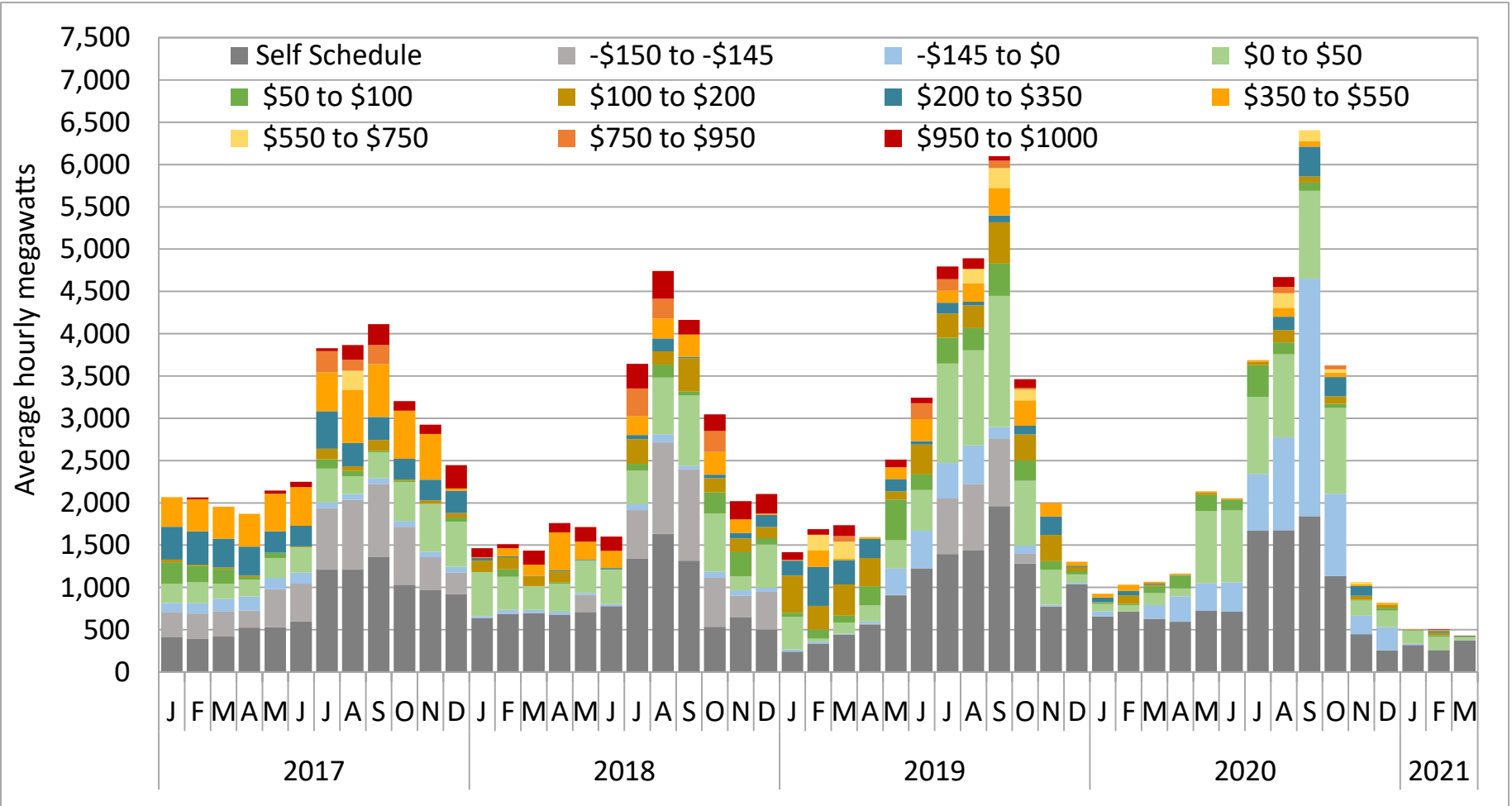
Reduction of wind and solar generation high within the ISO, almost all economic



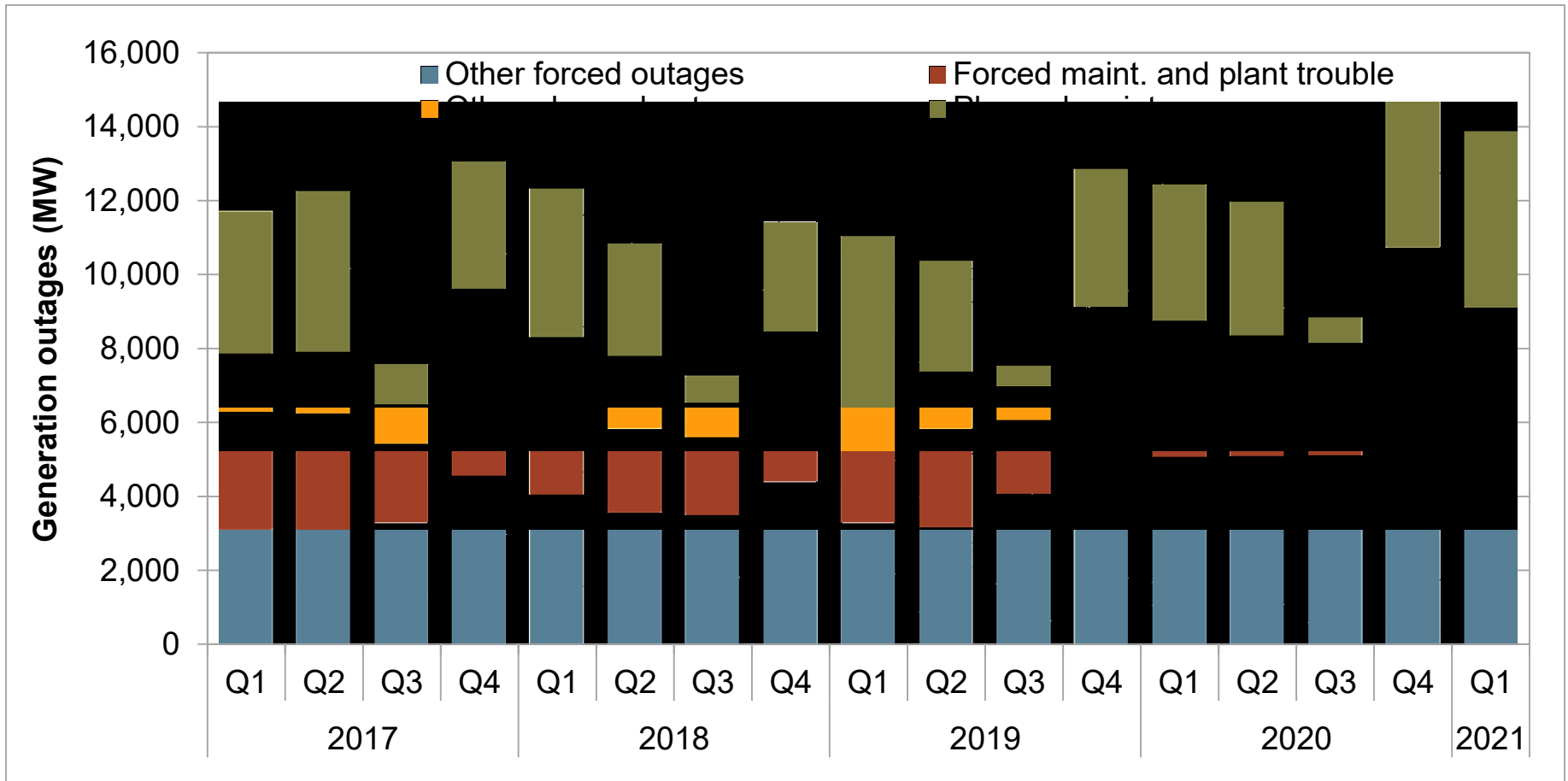
Average hourly net interchange decreases in mid-day



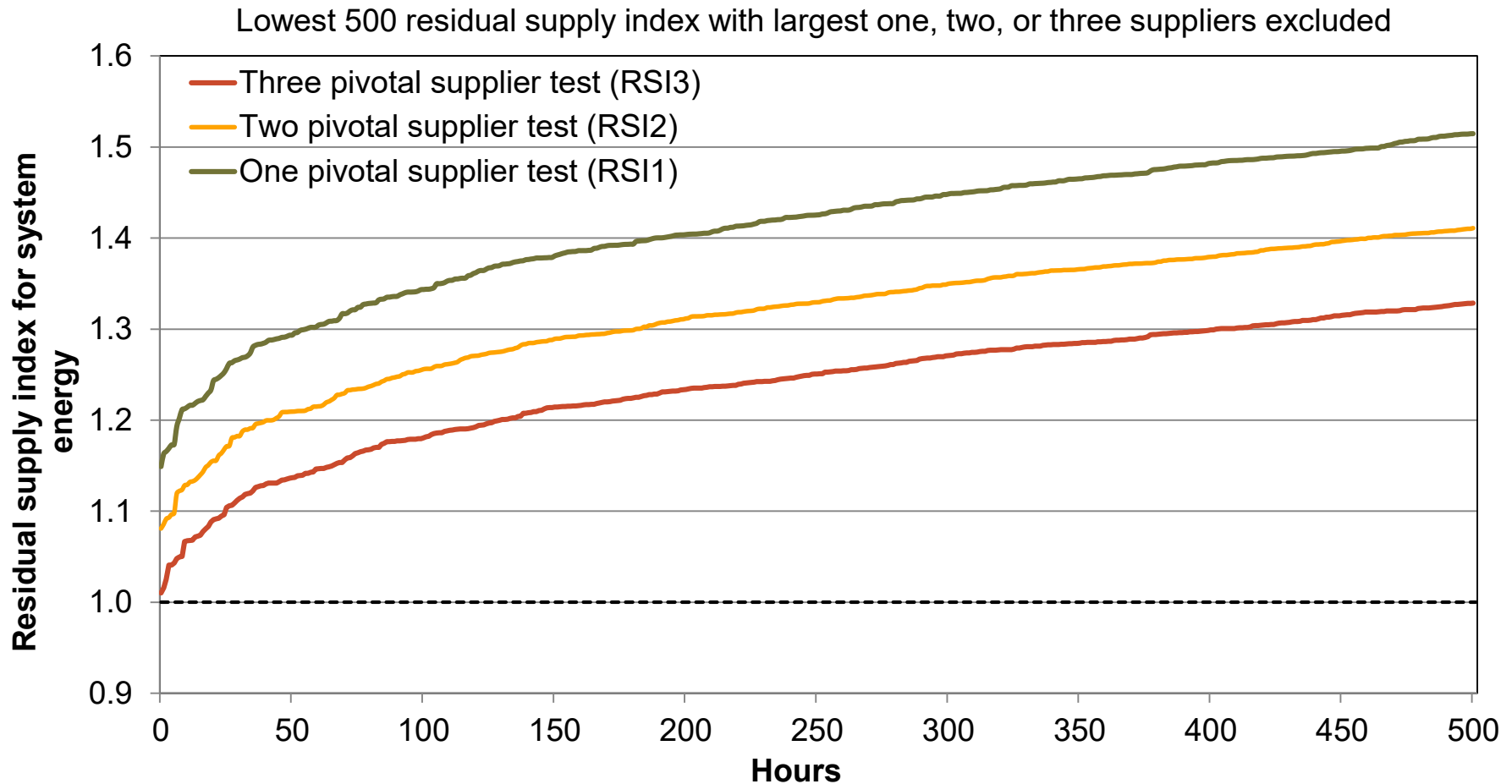
Resource adequacy import bids decrease in price and volume



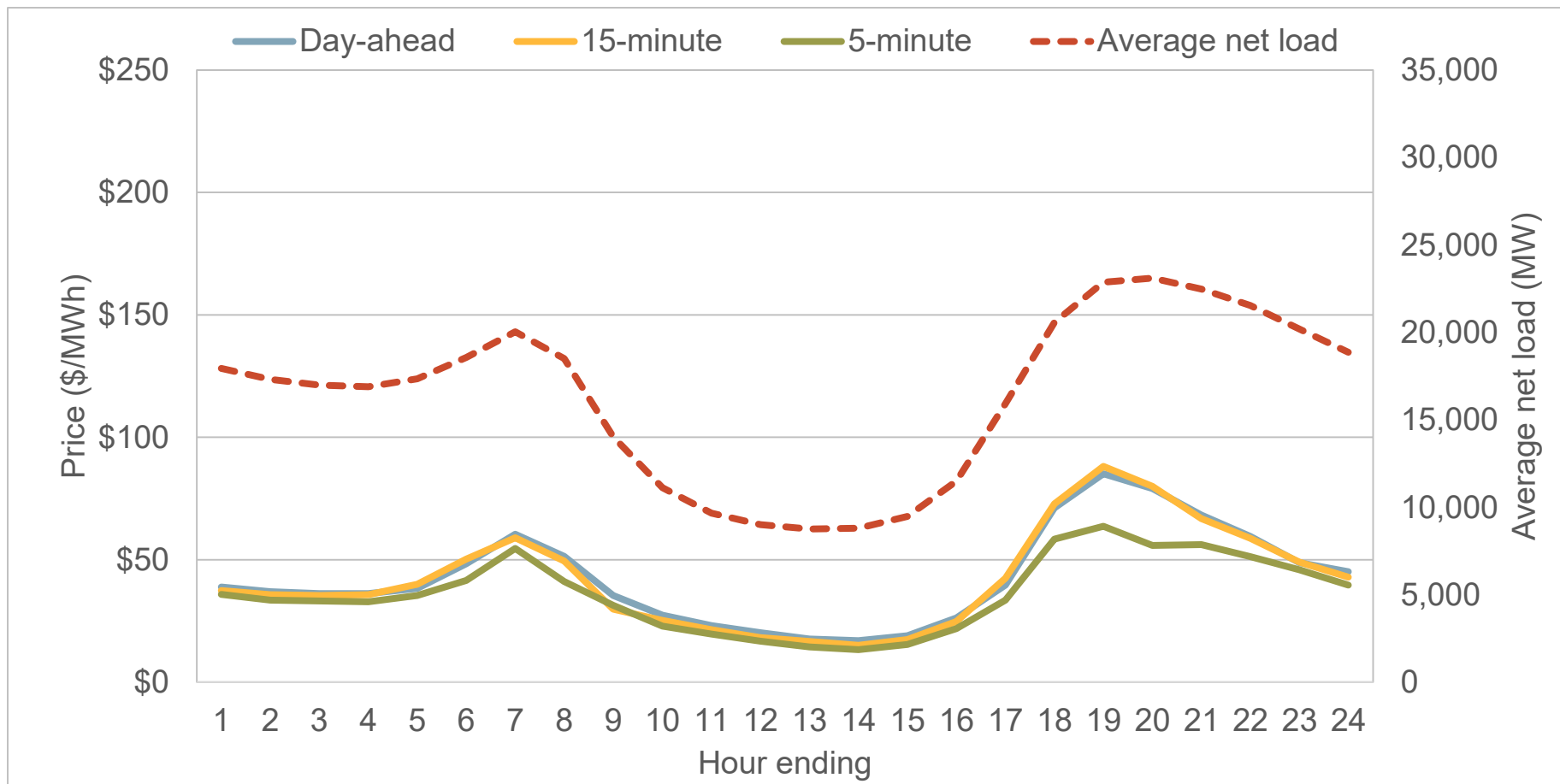
Generation outages increase relative to Q1 in prior years, planned up 20% and forced up 6%



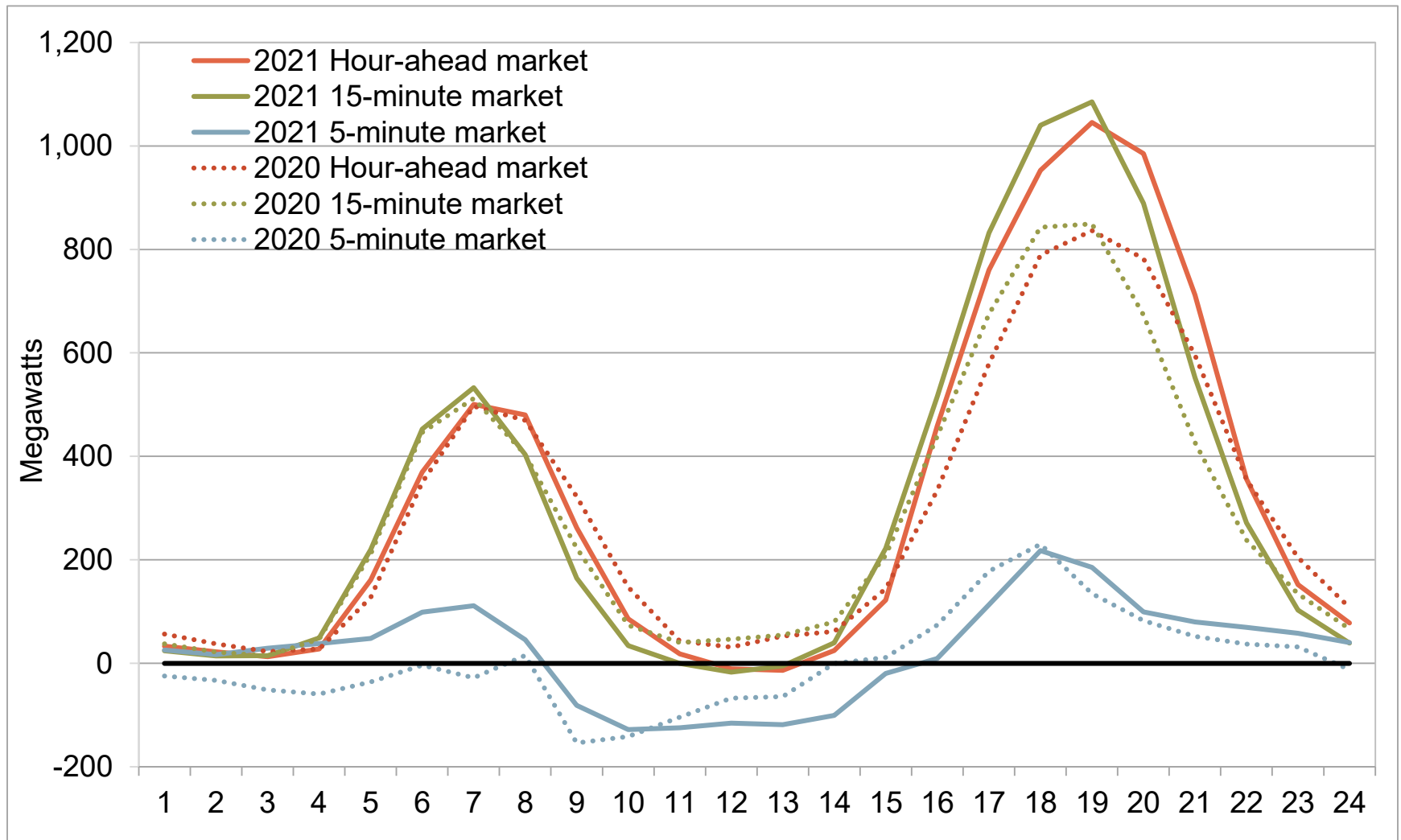
The CAISO market was structurally competitive in all hours of Q1 2021



Average prices up – with highest average prices in net load peak hours



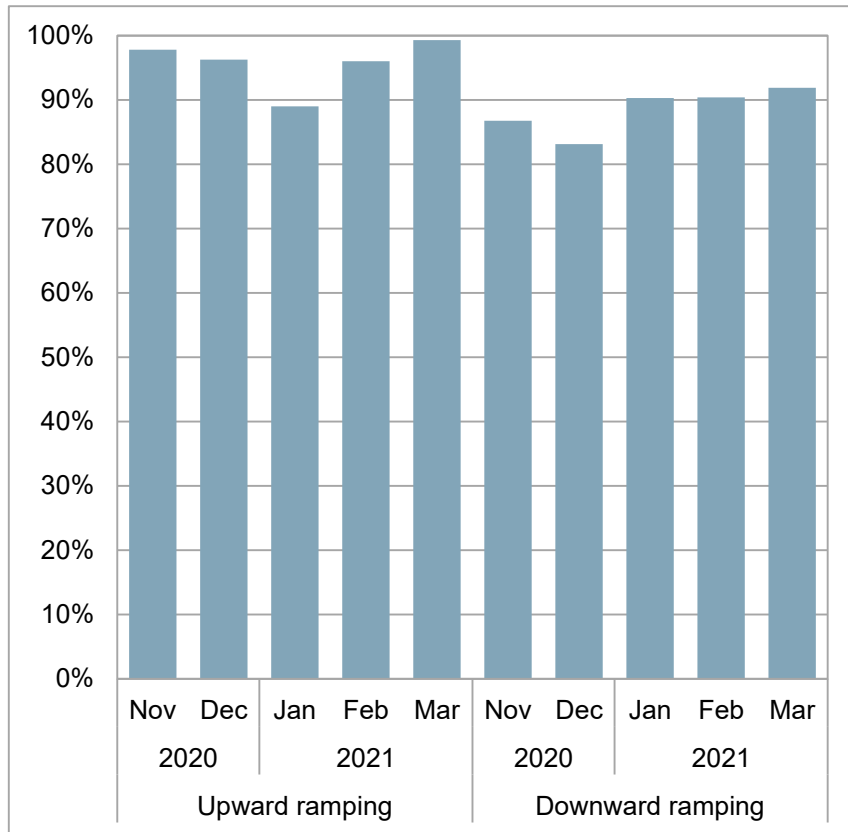
Imbalance conformance adjustments continue to increase



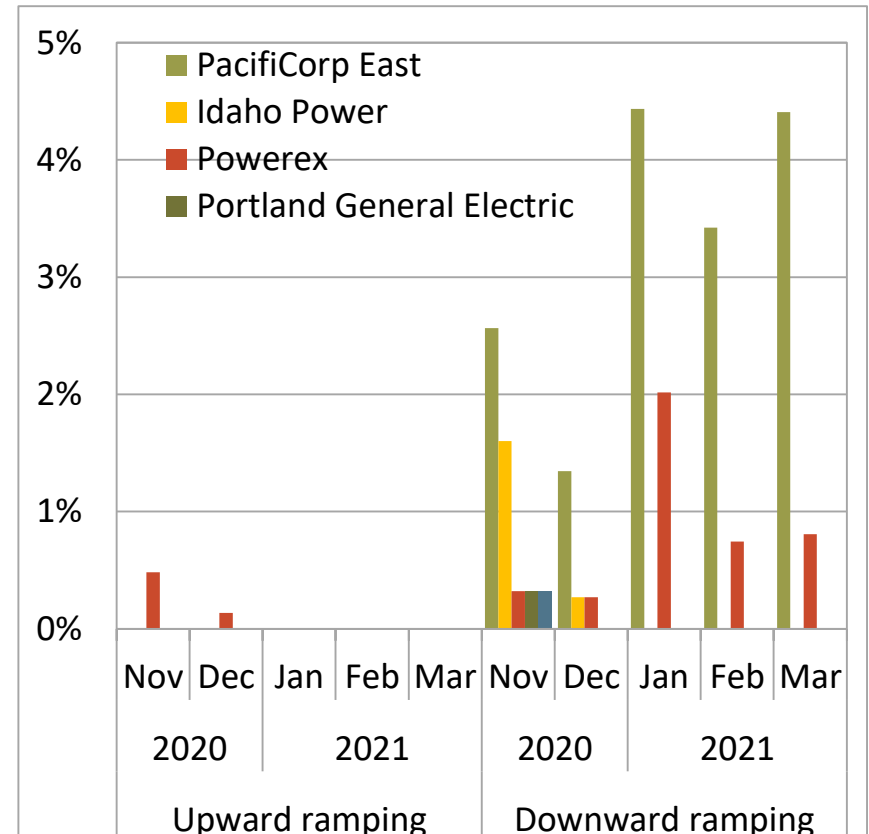
Minimum area requirement introduced November

Frequency minimum area requirement enforced

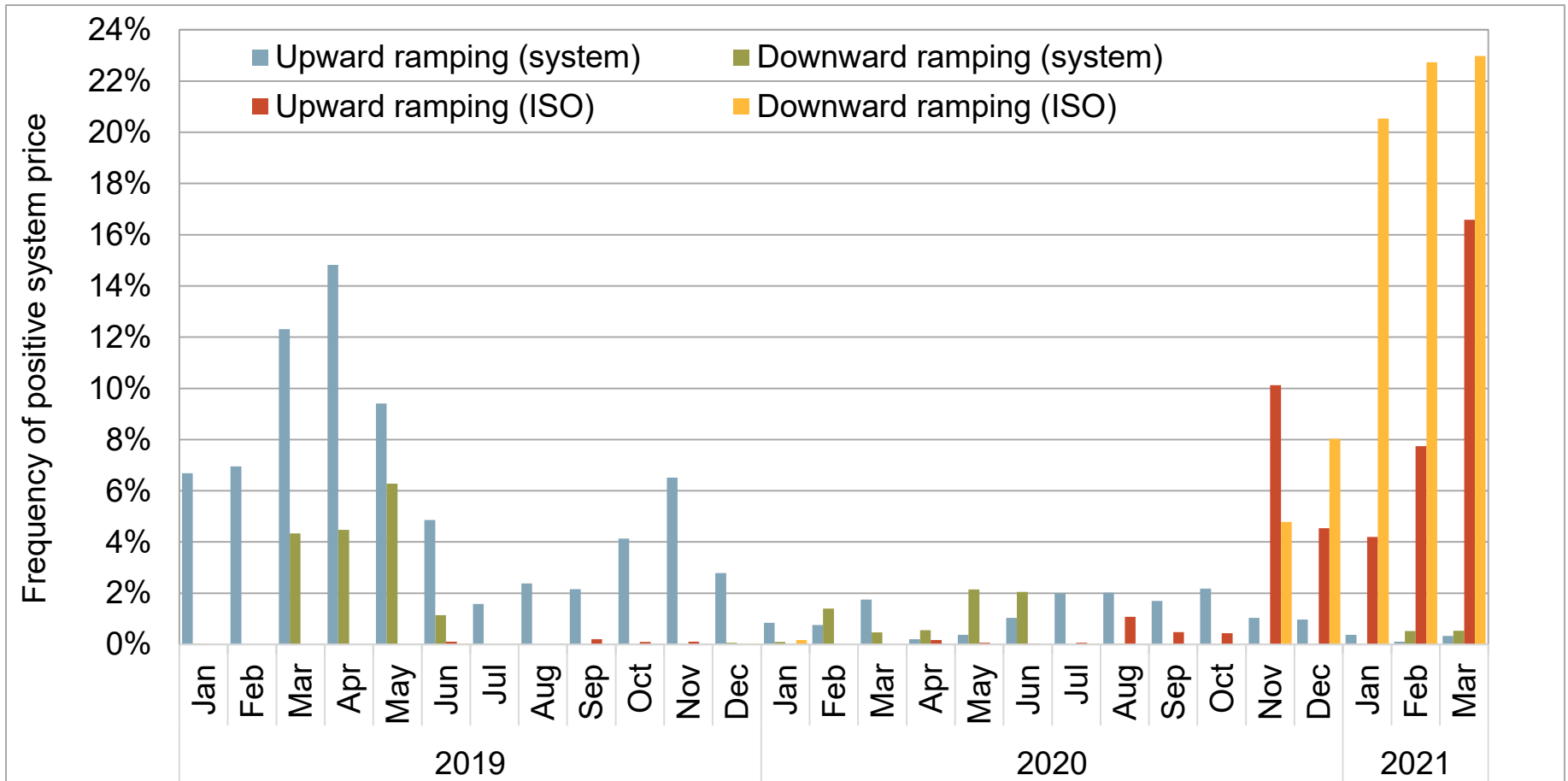
California ISO



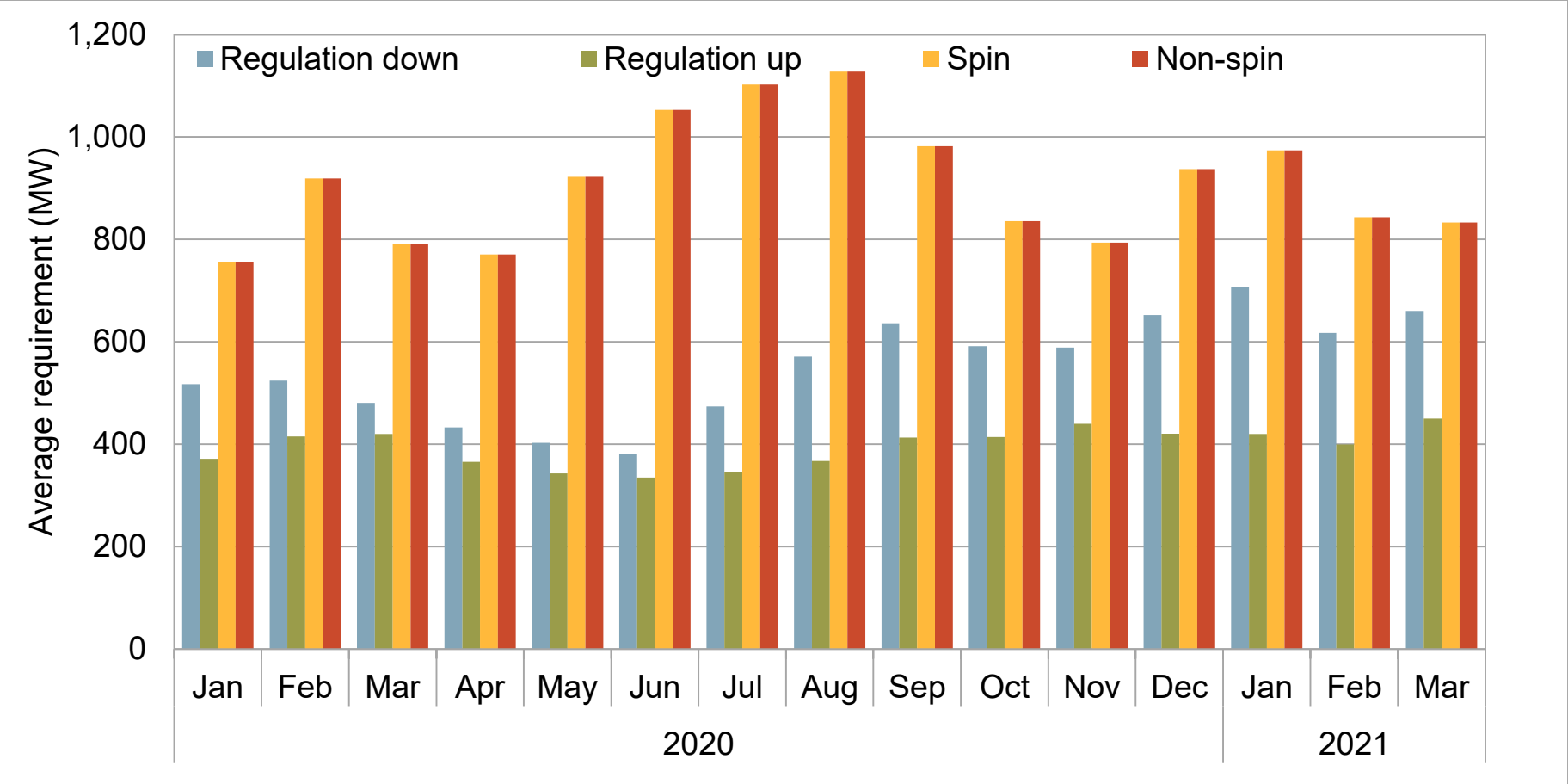
Energy Imbalance Market



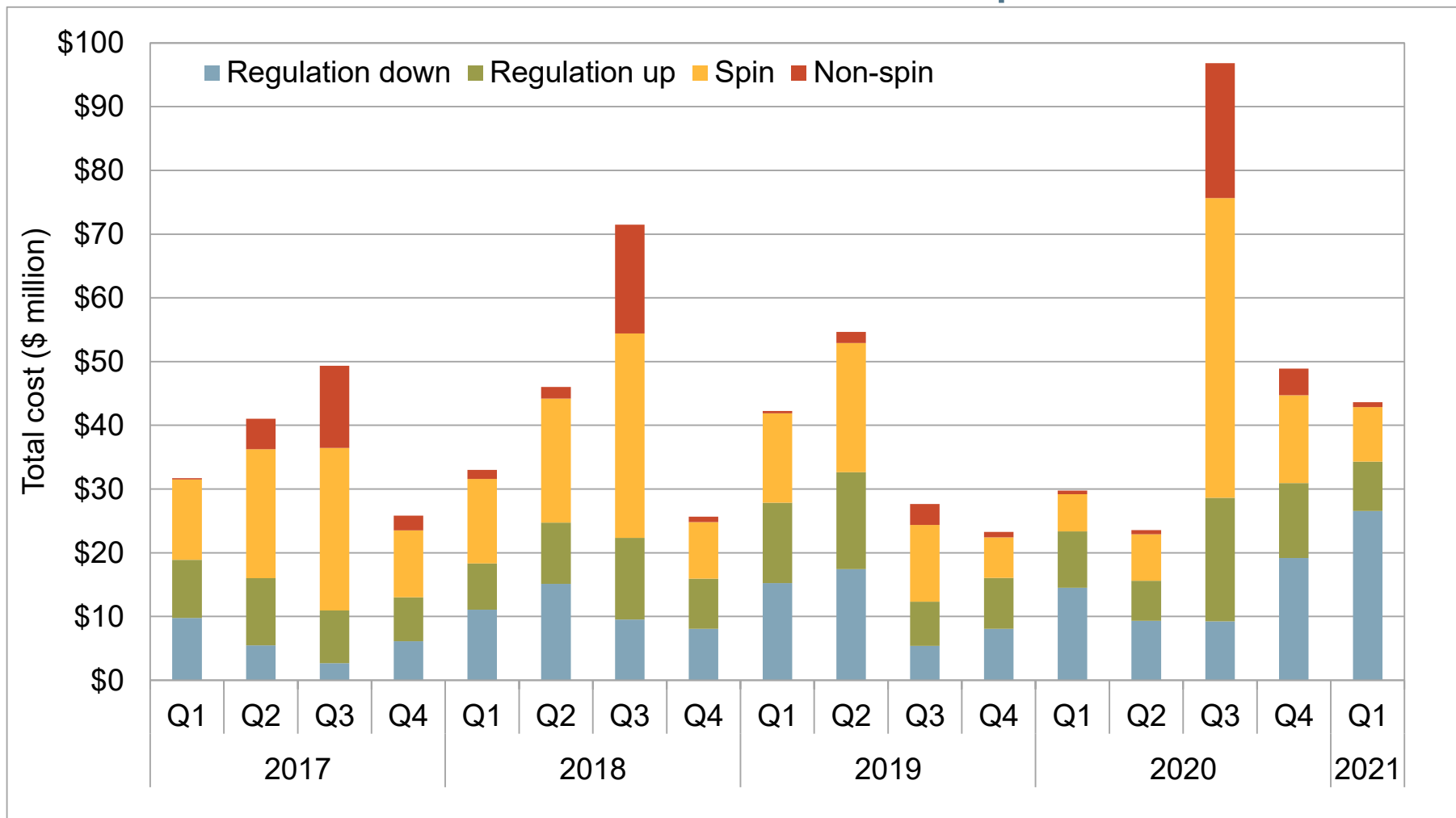
Monthly frequency of positive system or ISO flexible ramping shadow price (15-minute market)



Average monthly day-ahead ancillary service requirements increase over Q1 2020

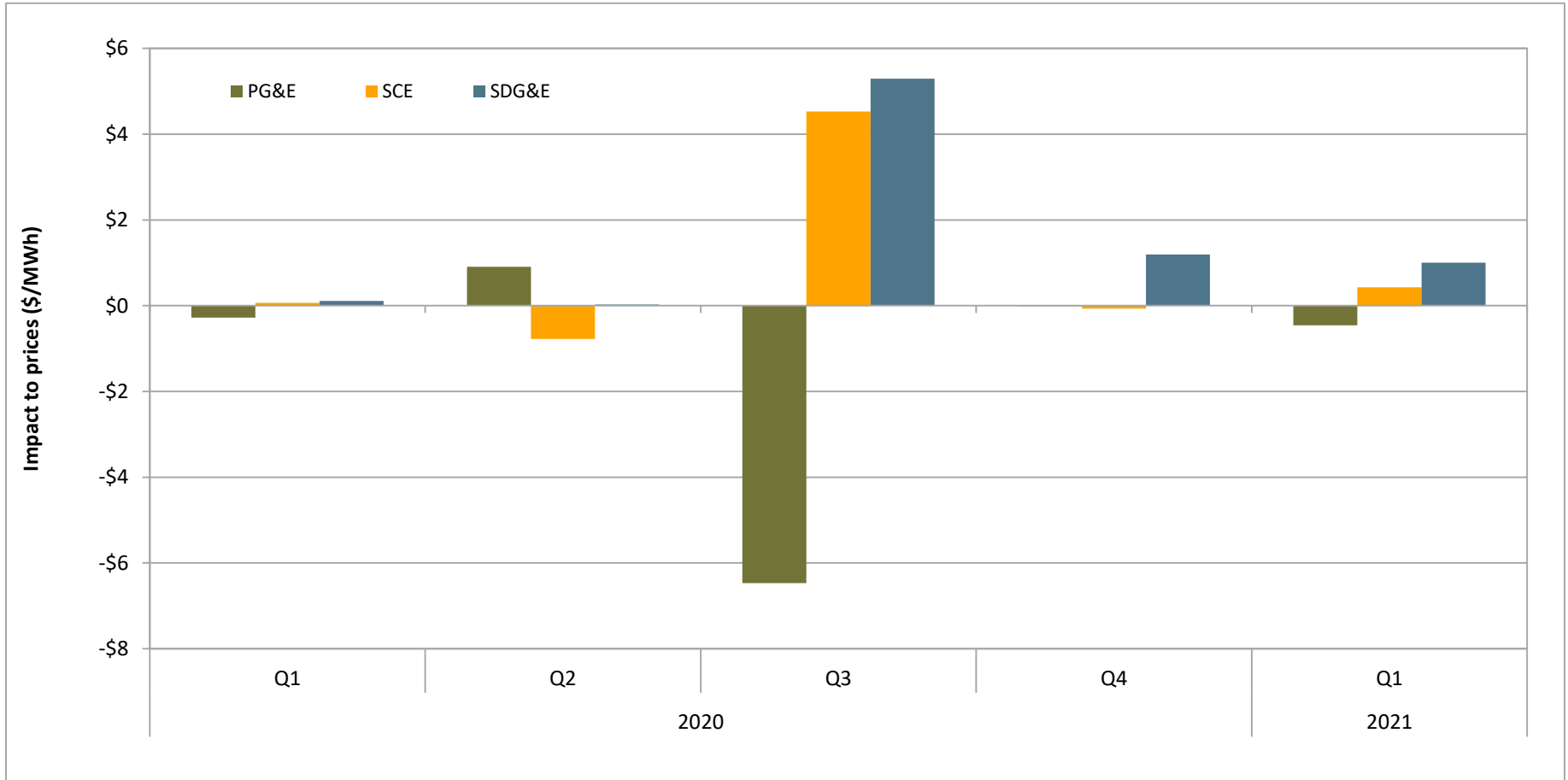


Ancillary service costs by product, increase to \approx \$44 million from \$30 million in the same quarter of 2020

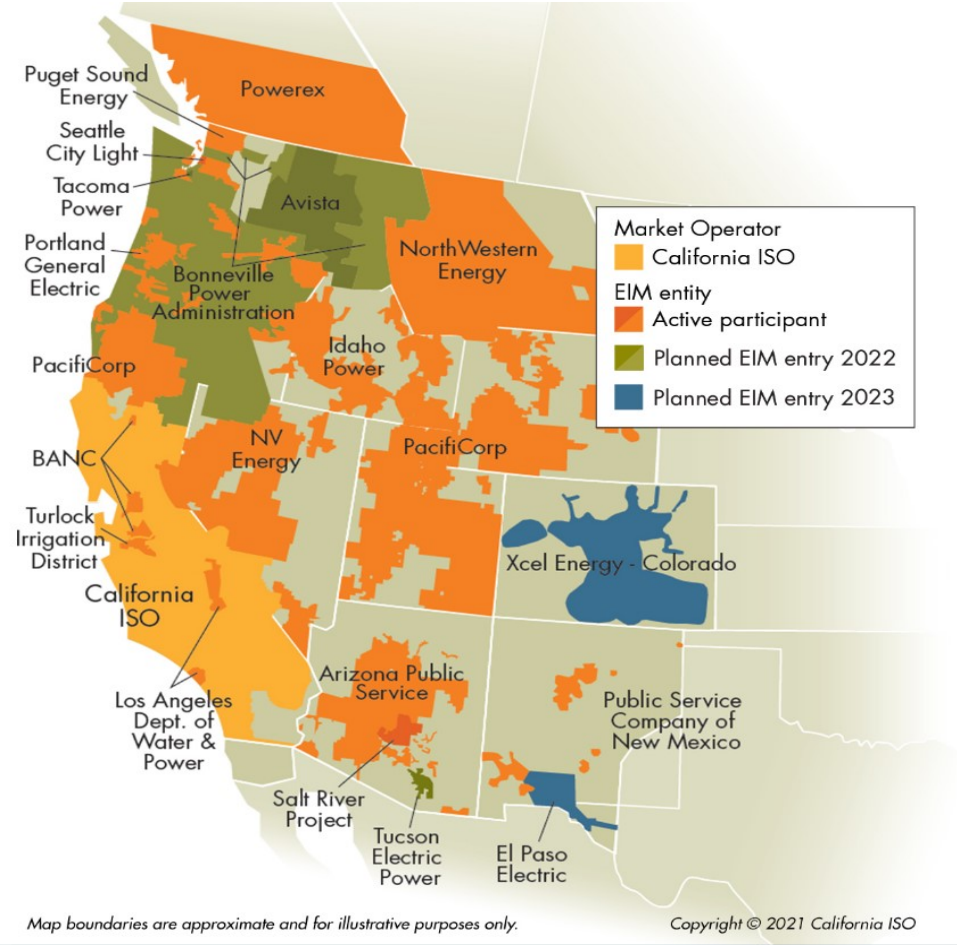


Congestion increased in the first quarter

\$194 million day-ahead congestion rent greater than the first quarter of 2020 (\$75 million)

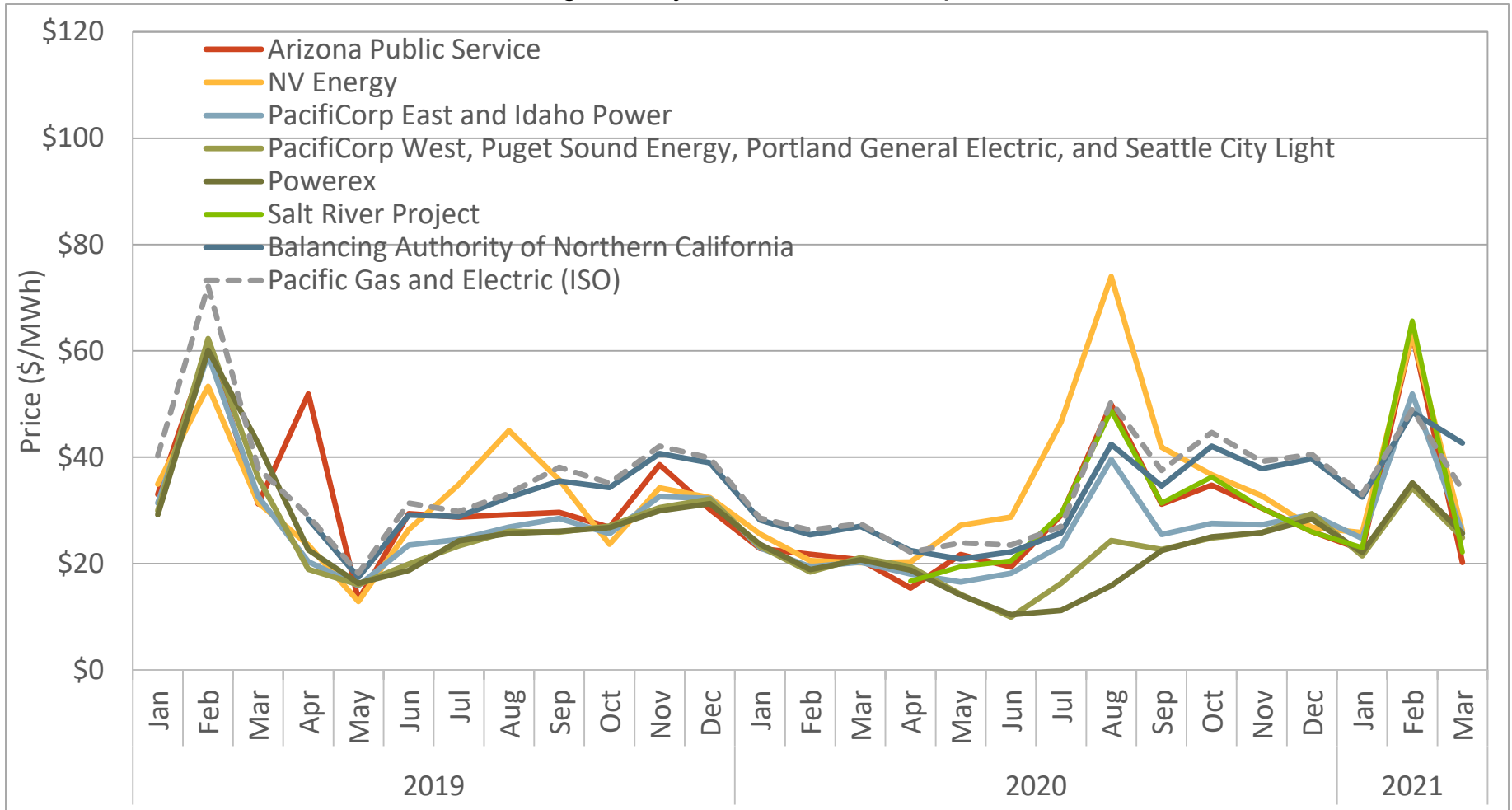


Turlock Irrigation District and the Balancing Authority of Northern California joined the EIM on March 25, adding > 6 GW of generation and > 3 GW of transfers



Peak prices in California exceeded the rest of the system

Average hourly 15-minute market pieces



EIM Sufficiency Tests

- Two types of test performed as part of resource sufficiency evaluation each hour for each 15-minute interval:
 - Bid range capacity test (a.k.a. “capacity test”)
 - Flexible ramping sufficiency test (a.k.a. “sufficiency test”)
- If an EIM balancing area fails one of these upward tests, net EIM imports into the area are capped based on advisory interval import
- Purpose of tests:
 - Ensure sufficient resources are scheduled/offered in EIM to cover load forecast and ramping needs (plus some uncertainty)
 - Deter excessive or intentional “leaning” by individual EIM areas for capacity needed to meet loads and uncertainty
 - Also viewed by FERC as a mechanism to help deter exercise of market power through physical withholding of resources

Bid range capacity test

- ISO identified two issues, corrected February 4, 2021:
 - Resource de-rates and outages were not accounted for resulting in higher resource capacity relative to actual availability
 - Mirror resources were incorrectly included for the ISO, impacting net scheduled interchange and the capacity test requirement
- ISO is proposing to add uncertainty to bid range capacity test

Frequency of upward capacity tests by month, % of intervals

California ISO	—	—	—	0.1	0.2	—	—	—	—	—	—	—	—	—	—
BANC	—	—	—	—	—	—	0.0	0.0	—	0.1	0.0	—	—	—	0.1
NV Energy	—	—	—	0.0	0.0	—	—	—	—	0.1	0.2	—	—	0.3	0.1
Arizona PS	—	—	0.1	—	—	0.0	—	—	—	—	—	0.3	0.2	0.4	0.1
Salt River Project	■			0.2	—	—	—	—	—	0.1	0.1	—	—	8.0	0.1
Idaho Power	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
PacifiCorp East	—	—	—	—	—	—	—	—	—	—	0.1	—	—	—	0.1
PacifiCorp West	—	0.1	—	—	—	—	—	—	—	—	0.1	—	—	—	0.2
Portland GE	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1	0.1
Seattle City Light	■			—	0.1	—	0.2	0.1	—	—	—	—	—	—	0.1
Puget Sound En	—	0.1	—	—	—	—	—	—	—	—	—	—	—	0.1	0.7
Powerex	0.4	0.2	0.3	0.2	0.3	—	—	—	0.1	0.1	0.1	—	0.1	0.0	0.1
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
	2020												2021		

Frequency of upward sufficiency tests by month, % of intervals

California ISO	—	—	—	0.1	0.2	—	0.1	1.1	0.5	0.4	0.5	—	—	—	—
BANC	—	0.2	—	—	—	—	0.0	0.2	0.0	0.2	0.0	0.1	—	—	0.1
NV Energy	—	0.6	0.1	0.7	2.6	2.3	4.5	7.1	2.6	1.5	0.8	—	0.1	0.7	0.5
Arizona PS	1.3	1.1	1.5	0.1	1.0	0.0	—	—	0.3	0.8	0.7	0.6	0.5	0.6	0.3
Salt River Project				1.9	0.1	0.5	0.7	1.8	1.1	1.8	0.9	0.3	0.2	9.8	0.4
Idaho Power	—	—	—	—	0.1	0.3	0.1	0.2	—	—	—	—	—	0.1	0.1
PacifiCorp East	0.0	0.0	0.1	0.0	0.2	0.1	0.2	0.2	0.1	0.5	0.2	—	0.1	0.1	0.3
PacifiCorp West	0.2	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.0	0.2	0.3
Portland GE	—	0.2	0.1	—	—	0.0	0.2	0.2	0.6	0.1	0.1	0.2	0.3	0.6	0.2
Seattle City Light				—	0.1	—	0.2	0.1	0.1	0.2	0.2	0.1	—	—	0.1
Puget Sound En	—	0.3	—	—	0.0	0.3	0.6	0.4	—	0.2	—	—	—	0.1	0.7
Powerex	0.5	0.3	0.3	0.2	0.5	0.2	0.2	0.1	0.3	0.1	0.7	0.2	0.4	0.1	0.2
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
	2020												2021		

Frequency of downward sufficiency tests by month, % intervals

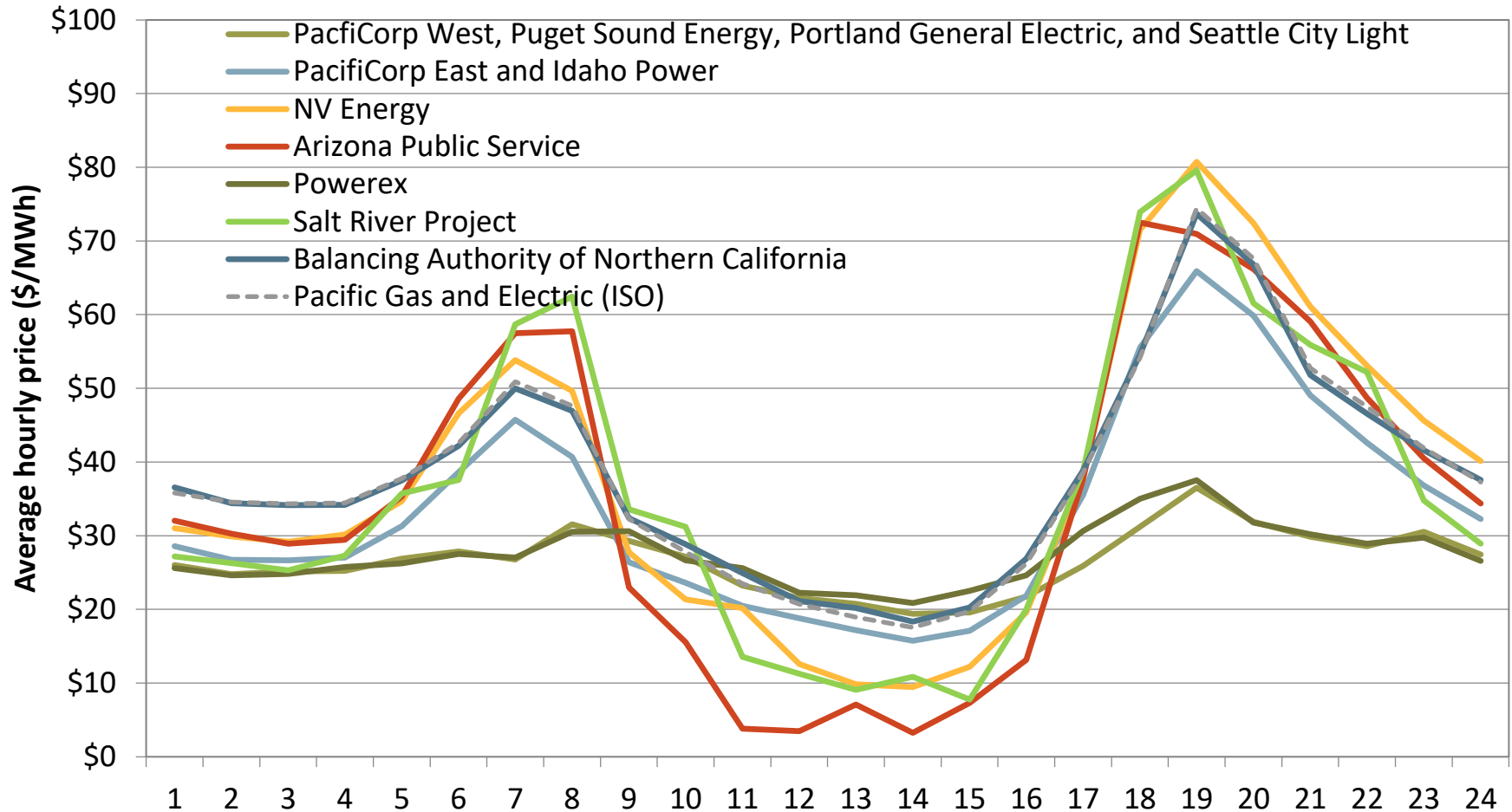
California ISO	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BANC	—	0.9	0.7	0.6	1.3	0.3	—	—	—	0.1	0.4	—	—	0.6	0.4
NV Energy	0.4	2.1	2.4	4.9	6.7	5.1	0.7	0.8	2.2	0.7	1.5	1.1	0.2	6.1	1.5
Arizona PS	3.0	1.3	3.0	1.2	0.7	2.3	0.1	—	0.1	2.1	1.1	2.5	2.2	2.3	4.4
Salt River Project				1.0	1.2	0.2	—	0.0	0.1	0.2	0.3	0.8	1.1	1.6	1.3
Idaho Power	—	0.1	0.2	0.1	0.8	—	0.0	—	—	0.2	0.2	—	—	—	0.1
PacifiCorp East	—	—	—	0.1	0.1	—	—	—	—	0.1	0.1	—	—	—	—
PacifiCorp West	—	—	—	0.1	0.1	—	—	—	—	0.1	0.1	—	—	—	0.1
Portland GE	0.1	—	—	0.1	0.4	0.1	—	—	—	0.1	0.1	—	0.0	—	—
Seattle City Light				0.6	0.1	—	0.1	0.2	0.2	0.2	0.2	0.1	—	—	0.0
Puget Sound En	—	—	—	0.1	0.6	0.8	0.1	—	—	0.1	0.1	—	—	—	—
Powerex	0.2	0.4	0.0	0.1	0.3	—	0.1	0.1	0.1	0.2	0.1	—	0.4	—	1.5
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
	2020												2021		

The ability to transfer energy between areas is one of the key benefits of the EIM

Average 15-minute market limits between January 1 and March 24, 2021

		To Balancing Authority Area											Total export limit	
		CISO	BANC	NEVP	AZPS	SRP	PACE	IPCO	PACW	PGE	PSEI	SCL		PWRX
From Balancing Authority Area	California ISO		1,580	3,470	1,080	1,860			50	100	0		130	8,270
	BANC	1,590												1,590
	NV Energy	3,710			400		790	500						5,400
	Arizona Public Service	2,260		380		7,970	630							11,240
	Salt River Project	2,470			5,030		0							7,500
	PacifiCorp East			650	610	0		900	430					2,590
	Idaho Power			500			1,920		450		0	30		2,900
	PacifiCorp West	120					260	350		410	150	10		1,300
	Portland GE	90							410		150	10		660
	Puget Sound Energy	0						10	90	150		350	150	750
	Seattle City Light							30	30	10	450			520
	Powerex	0									300			300
<i>Total import limit</i>		10,240	1,580	5,000	7,120	9,830	3,600	1,790	1,460	670	1,050	400	280	

Hourly 15-minute market prices



Commitment cost and default energy bid enhancements – phase 1, implemented February 16

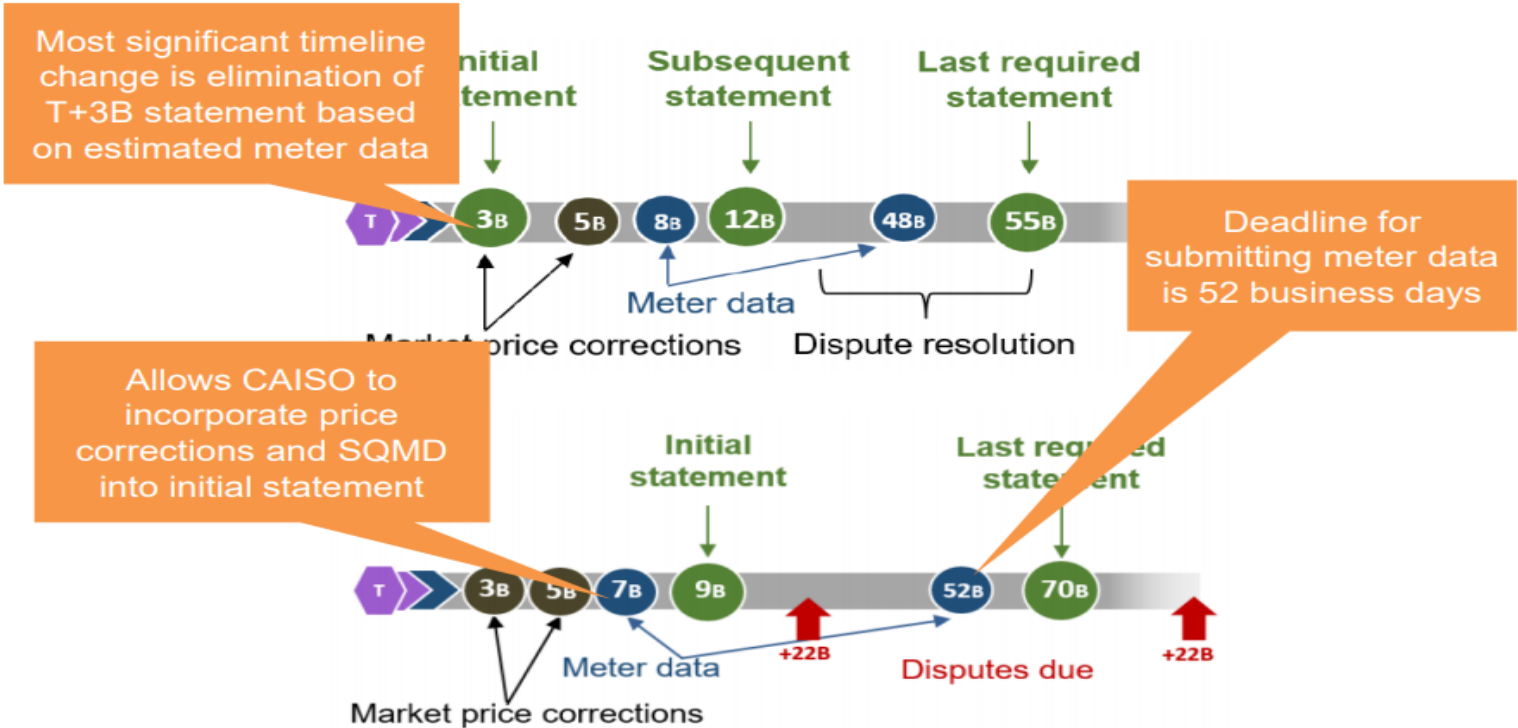
- Allows market participants to request adjustments to the marginal cost reference levels used in mitigation and to make after-market requests for cost recovery to the ISO
 - Automated and manual request process
- 20 manual reference level requests were made during the week of higher gas prices
 - Most were rejected due to lack of documentation or because the requested fuel price was low enough to be submitted through the automated process
- 1 automated request was accepted, but there was no impact because the resource was on outage

FERC Order 831 compliance, implemented March 20

- Allows some resources to bid between \$1,000/MWh and \$2,000/MWh
- Raises the penalty prices associated with a power balance constraint under-supply violation from \$1,000/MWh to \$2,000/MWh
- After-market cost recovery for costs above \$1,000/MWh available with implementation of CCDEBE February 16
- Phase 2 implemented June 13, 2021

Settlement timeline changes prevent timely reporting on market settlements – but DMM will monitor

Required Settlement Timeline Comparison



<http://www.caiso.com/Documents/Presentation-MarketSettlementsTimelineTransformationTraining.pdf>